

Kruppstraße 105  
60388 Frankfurt

Express Mail mailing label no. EI750167183US  
Deposited December 17, 1999

Method and system for transmitting data for a security  
system of a motor vehicle

The invention relates to a method for transmitting data for a security device, in particular for access authorization systems and/or driving authorization systems of a motor vehicle, in which data are transmitted over the air from a transmitter unit to a receiver unit, and a system for activating and/or deactivating a security device.

The transmitter signal is transmitted only if the person carrying the transmitter is at a predefined distance from the motor vehicle, which distance lies within the range of the transmitter.

The transmitter is activated here by means of a signal from the receiver without manual intervention of the user. When the high-frequency radio link is used, the

information item is modulated onto a carrier frequency which is in the megahertz or gigahertz range.

5 However, the advanced telecommunications possibilities also permit the identification code to be interrogated in a contactless fashion over relatively large distances, unnoticed by the vehicle owner, and to be transmitted to the motor vehicle without the vehicle owner being aware of it.

*Summary of the Invention.*

*a* 10 The invention is thus based on the object of <sup>providing</sup> ~~specifying~~ a method in which, despite contactless interrogation of the identification signal transmitter, third parties cannot obtain authorizing access information.

15

The object is achieved according to the invention in that, after capacitive coupling of the transmitter unit and receiver unit, the data are transmitted from the transmitter to the receiver using a signal which is  
20 generated by a capacitive alternating field.

25

The advantage of the invention consists in the fact that the transmission link does not come into operation until the user, who is carrying the identification  
25 signal transmitter on his person, comes very close, up to a few millimeters. As a result, a high degree of operational security against tampering by third parties is obtained, in particular misuse through lengthening transmission link distances through relays (relay  
30 attack) is advantageously prevented. The transmission of data and thus identification is restricted to the immediate vicinity of the user.

35

After reception of the signal, the transmitter will advantageously transmit an encoded information item to the receiver on a second wireless transmission link, which information item is compared with a predefined encoded information item in the receiver, a drive

signal for the security device being output when said items correspond.

5 The plausibility check of the encoded information item is only carried out, in a manner known per se, in the receiver of the motor vehicle once the identification transmitter has been woken up by the start signal and identified itself.

10 The second transmission link which is provided for the encoded information item is implemented here by means of inductive coupling or far-field coupling.

15 In another refinement of the invention, a system for activating and/or deactivating a security device, in particular for access authorization systems and/or driving authorization systems of a motor vehicle is provided, in which an encoded information item is transmitted over the air between a portable transmitter and a receiver, the receiver device comparing the received information item with a predefined encoded information item, and outputting a drive signal to the security device when these two information items correspond.

25 In order to achieve the present object, the receiver has a capacitive transmitter unit in which a first capacitor is operated with an alternating current generator, the transmitter having, for the reception of the encoded information, a second capacitor which, after capacitive coupling has taken place, receives the signal generated by the transmitter unit of the receiver and passes it on to an evaluation device of the transmitter.

35 This makes it impossible, even in such a device, for the encoded start signal to be monitored without being noticed.

In a development, after the start signal has been evaluated, the evaluation device generates an encoded information item which is transmitted from a transmitter unit of the transmitter to a receiver unit  
5 of the receiver by means of a far-field coupling.

The encoded information item is modulated onto a high-frequency carrier frequency generated by the alternating current generator.

10

The field of action of a capacitive transmission can be restricted to specific areas. The first capacitor is thus formed between the outer shell of an accessed device and an activation device which is arranged on  
15 the outer shell of the accessed device. As a result, the start signal is not generated until the user activates, for example, the door handle of the motor vehicle.

20 In order to monitor whether the correct identification signal transmitter is present for an immobilizer, the first capacitor is formed between the vehicle bodywork and a control element located in the interior of the vehicle. This control element may be, for example, the  
25 transmission shift lever of a motor vehicle.

The signal which is to be detected by the second capacitor is advantageously amplified by the user making contact with the activation device or with the  
30 control element. Owing to the high level of conductivity of the human body, it acts as a capacitor electrode with a large surface for the first capacitor, and thus as a transmission medium. This ensures that the second capacitor which is arranged on the  
35 identification signal transmitter reliably perceives the changes in capacitance of the first capacitor.

## Brief DESCRIPTION OF THE DRAWING

The invention permits numerous possible embodiments. One of them will be explained with reference to the figures illustrated in the ~~drawing~~, in which:

- a
- 5 Figure 1: shows an antitheft device according to the invention,  
Figure 2: shows an embodiment of a capacitive field.

10 Identical features are identified with identical reference symbols.

## DETAILED DESCRIPTION OF THE Preferred Embodiment

a

15 In the vehicle access systems and vehicle authorization systems which are currently in development, a contactless interrogation of an identification signal transmitter makes opening and starting a vehicle significantly more convenient. The identification signal transmitter can be carried here anywhere on the body (for example in a trouser pocket or a jacket pocket) and does not have to be explicitly operated.

20 Such a security device is composed of a portable transmitter 1 and a receiver device 2 which are permanently installed in a motor vehicle (not illustrated further). High-frequency radio signals 3 are exchanged in a contactless fashion between the transmitter 1 and the receiver device 2.

30 The transmitter 1 is composed here of a security code signal transmitter 4 in which the encoded information item is modulated onto a carrier frequency  $f_0$  of approximately 400 MHz. The security information which is generated in this way is passed onto a transmitter/receiver device 5 which is embodied as an antenna in the case of the transmitted radio signals 3.

35 A receiver device 6, also embodied as an antenna, of the receiver device 2 receives the radio signal 3 and passes it on to a control unit 7 of the motor vehicle which compares the encoded signal with a reference code signal stored in it. When these two information items

correspond, the control unit 7 outputs a drive signal either to the central locking system 8 of the motor vehicle in order to open or close the vehicle doors and/or to a immobilizer 9 in order to activate or deactivate the drive of the motor vehicle.

The transmission of the encoded information is, however, initiated by the transmitter 1 only if the transmitter 1 receives a start signal 16 from the receiver device 2.

In order to generate the start signal 16, a capacitor 10, which is operated with an alternating current generator 11, is arranged in the receiver device 2. This alternating current generator 11 can be activated continuously or only at predefined time periods. In order to transmit data simultaneously, a signal which contains the data can be modulated onto the carrier frequency which is generated by the alternating current generator.

As is clear from Figure 2, the capacitor electrodes of the capacitor 10 are formed by the vehicle bodywork 15 and a metal plate 12 and let into a door handle of the motor vehicle.

Similarly, a capacitor 13, which is connected to the reference code signal transmitter 4 via an amplifier device 14, is also located in the transmitter device 1.

The start signal 16 is generated in the following way: if the user approaches the motor vehicle, the capacitor 13 of the transmitter 1 will move, when in the direct vicinity of the door handle, or when he touches it, into the electrical field which is built up by the capacitor 10 between the door handle and the vehicle bodywork. As a result of the continuous change in this field owing to the driving by means of the alternating current generator, the variation in the field is

detected by the capacitor 13 of the transmitter unit 1. Said capacitor 13 generates a signal which corresponds to the changes and which is amplified by the amplifier 14 and passed onto the reference code signal transmitter 4, which is preferably embodied as a microcontroller.

This effect is amplified further by virtue of the fact that the user 17 himself serves as a transmission link between the transmitter 1 and receiver 2 by virtue of the fact that the capacitive coupling is amplified even further by the conductivity of his body.

It is possible to dispense completely with presence detectors such as are used to trigger the start signal.